XXVII.—*A Note upon the Anatomy of the Perignathic Girdle of* Discoidea cylindrica, *Lmk., sp., and of a Species of* Echinoconus. By Prof. P. Martin Duncan, M.B., F.R.S., &c., and W. Percy Sladen, Sec.L.S., F.G.S.

A paper upon the anatomy of the perignathic girdle of *Discoidea cylindrica*, Lmk., sp., was communicated to the Linnean Society, and was published in the 'Journal' of that Society for October 1886, vol. xx. p. 48.

It was explained (p. 56) that the perignathic girdle is remarkable and unique in shape, being low and surrounding the peristomial opening in the form of a raised, oblique, broad, ridge-like ring. The broad upper surface of the girdle is free and consists of flat or irregular slanting surfaces, the slant being towards the peristome and ending all round and outwards in a continuous and wavy free edge. This edge has the parts which correspond to the ambulacra thin, barely projecting, and reenteringly curved. The parts of the girdle which correspond to the interradia are boldly curved outwards and are large. The outer wavy edge of the girdle overhangs the inner surface of the base of the test.

No sutural lines exist in the specimen (no. 40341) in the British Museum from which the description was taken (see fig. 8, p. 56), upon the interradial expansion of the perignathic girdle. On the other hand, the median sutures of the ambulacral parts are distinct. It was remarked, "but it is not satisfactorily shown that there are not sutures between the ambulacral and interradial portions along the line of the slight groovings which are on either side of an ambulacrum high up in the peristome and at the lower edge of the inner surface of the girdle—that is to say, in the usual position of sutures in relation with branchial grooves or cuts."

Mention was made of the pairs of pores which are on either side of the median and more or less vertical suture of an ambulacrum. In ambulacrum III. there are two pairs of pores on one side of the median line and a single pair on the other; and in the other ambulacra, although the pores are not all distinctly shown, they appear to conform to the peristomial arrangement found in other regular Echinoidea.

All these pores are separated from the median sutures and also from the ill-defined sutures between the ambulacral and interradial portions of the girdle.

In September 1888 one of us received a letter from our friend Prof. Sven Lovén, drawing attention to a paper of his, read Dec. 14, 1887, and published in 1888, "On a Recent

Form of the Echinoconidæ" (Bihang till Kongl. Svenska Vet.-Akad. Handl. Bd. xiii. Afd. iv. no. 10), and explaining why he had not noticed our paper upon the perignathic girdle of *Discoidea cylindrica*, Lmk. Prof. Sven Lovén wrote that he could not reconcile our drawing (fig. 8, p. 56) with the results of his own observations upon several specimens, and that as he disliked animadversion he had thought it best to publish his figures and to leave ours alone and uncriticized. He also sent us his interesting paper, containing beautiful illustrations.

We thank our friend very cordially for his courtesy, but we think that it is due to him that his discoveries should be placed on record in a paper which will also do justice to ourselves.

We have nothing to retract or to add regarding the description given by us of the specimen in the British Museum. Prof. Sven Lovén's beautiful drawing shows, in addition to what may be seen in the specimen we studied, distinct suturing of the interradial expansions of the girdle, some minute plates at the ambulacral edge of the interradial expansion, but one pair of pores on either side of the ambulacral median line, and that the outer pore of each pair is either along the line of the ambulacro-interradial suture or beyond it and in the edge of the interradial expansion. The drawing by Prof. Lovén (*op. cit.* p. 9, fig. 1) gives the impression that the parts of the interradial expansions next to the poriferous zones are ambulacral and therefore relics of "processes" *.

It is perfectly evident that Prof. Lovén intended to convey that these relics are those of "auricles" (ambulacral processes in other terminology), and, indeed, in his description of his fig. 2 he wrote "Four auricles from the aboral side and an ambulacral pair in the middle."

It became necessary for us to examine other specimens, so as to compare our results with those of Prof. Lovén upon

1. The position of the ambulacral pairs of pores.
2. Comparison of the teaching afforded by the original specimen and by those of Lovén.
3. The sutures of the expansions in new specimens.

Numerous specimens of *Discoidea cylindrica* were cut, and without satisfactory results, the girdle being absent or ruined; but, thanks to Mr. Gregory, F.G.S., of the British Museum, we have been able to study a very fairly preserved specimen.

* The terminology will be found explained in Journ. Linn. Soc., Zool. vol. xix. p. 179 (1885), "On the Perignathic Girdle of the Echinoidea."

The perignathic girdle is better preserved in some parts than in the specimen originally described by us; but while the pores of the ambulacra are not so clearly placed as in the early specimen, there are, beyond a doubt, sutures in the interradial expansions (the ridges).

1. Taking the old and this new specimen as examples, it is shown in them that the interradio-ambulacral suture is distinct and that the pairs of pores are between it and the median suture of the ambulacrum.

It appears, then, that no part of the expansions is truly ambulacral; all is interradial.

Very respectfully we would draw our friend's attention to his drawing, fig. 2. There is a slightly oblique and not quite transverse suture separating the ambulacral plate of zone *b* nearest the peristome from the expansion. In our opinion that suture is the natural limit of the ambulacral region and is interradio-ambulacral. Consequently the plate which this suture bounds actinally is interradial and not ambulacral.

2. As the evidence of the facts just noticed is clear and the drawing given by Prof. Lovén is doubtless correct, we must admit that variation is possible in the construction of the girdles of these forms, which are considered to be Gnathostomes by some and to be Edentates by other naturalists.

3. In the specimen originally examined by us there is not the slightest vestige of sutures in any one of the expansions, and we had no right to assume that there were any.

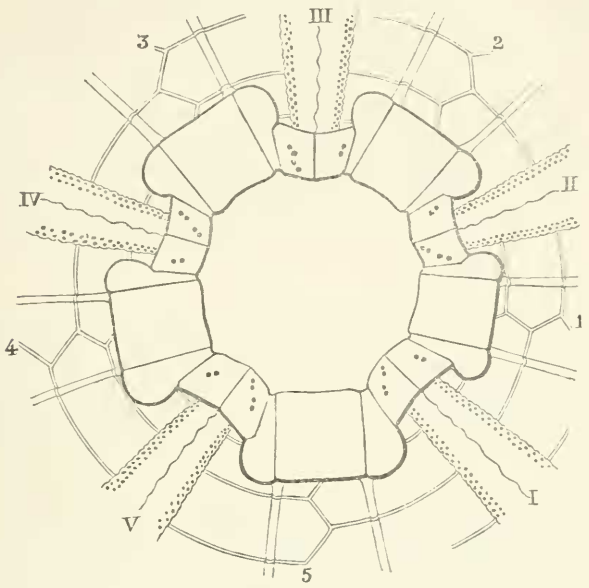
Prof. Lovén shows (*op. cit.* p. 9, fig. 1) that there are certainly three sutures in each expansion, irrespectively of what may be considered as interradio-ambulacral sutures. Possibly there are two others uniting small triangular pieces to the outer edges of expansions.

In the lately cut specimen at the British Museum there are distinct sutures in the interradial expansions, but their distribution differs from that figured by Prof. Lovén.

Prof. Lovén shows that in each expansion there is (*α*) a median suture, (*β*) a suture on either side of the median suture, being parallel at some distance. Each of these two sutures, which are parallel with the median one, bounds a plate at the side of the median suture which unites the plates. Each one of these two sutures seems to start from close to the interradio-ambulacral suture at each branchial incision, a small space intervening.

According to Prof. Lovén's drawing (fig. 1) the interradio-ambulacral sutures are curved, and they limit a plate, a considerable part of which is free towards the ambulacrum and which has upon its corner the little plate and suture already

mentioned. In the British Museum specimen there is (*a*) no median suture in any expansion. There are (*β*) two sutures in the position of those discovered by Lovén. These sutures are nearly or quite parallel and include a single median plate.



The interradio-ambulacral suture arises close to the other sutures and bounds the ambulacrum, there being a plate between it and the suture *β* triangular in shape, with its point at the branchial incision. The dimensions of these triangular plates varies, and in no instance is there the small additional plate described by Prof. Lovén.

Median sutures are so common in the ridge portion (interradial) of perignathic girdles (see Journ. Linn. Soc., Zool. vol. xix. pl. xxxi.) that their presence would have been anticipated in *Discoidea*; but the variability of the girdle seems to extend to the suturing.

According to Prof. Lovén's view the plates on either side of the median suture of the interradial expansion of the perignathic girdle are truly interradial, and the plates on either side of them are ambulacral.

According to the terminology suggested and employed in the researches on the nature of the perignathic girdle of the Echinoidea (Journ. Linn. Soc., Zool. vol xix.) the plates on

either side of the median line are homologous with the "ridges" and the other plates with the "processes."

According to the inferences which arise after studying the British-Museum specimens, the median plate is one plate of a "ridge" and those on either side of it are other plates of the same structure. There is no ambulacral process.

If it is admitted, as it well may be, that the specimens in the British Museum have had the plates on either side of the median suture so fused that the union is no longer visible, the clear definition of the ambulacral areas indicates that no portion of an ambulacrum exists on the flanks of the interradial expansions. From the evidence before us, and after studying Prof. Lovén's figures, we hold that ambulacral processes or their homologues are absent and that the expansions are analogous to, and to a certain extent homologous with, the "ridges" of Cidaridæ.

It must be remembered, however, that in *Diadema setosum* the "ridges" of the perignathic girdle have a median sutural line separating two plates, on either side of which is a plate clearly belonging to the interradium. The gradual evolution of this arrangement can be appreciated by comparing figures 41, 42, 43, and 49 in Journ. Linn. Soc., Zool. vol. xix. pl. xxxi.

Finally we regret to differ from our friend respecting the presence of jaws and teeth in the genus *Discoidea*. We cannot find any probable or demonstrative evidence in favour of their existence.

Echinoconus (= *Galerites*).

Prof. Lovén believes that a structure similar to that of the perignathic girdle of *Discoidea cylindrica* "maintains in *Galerites albogalerus*," that is to say in *Echinoconus*. He also credits this well-known species with jaws and teeth.

In the 'Geological Magazine,' 1884, dec. iii. vol. i. no. 1, p. 10, one of us enlarged upon the nature of the peristomial structure of *Galerites albogalerus*=*Echinoconus conicus*, and proved that the so-called teeth described by E. Forbes and Wright are buccal plates (p. 18); no jaws or teeth have been found.

It was explained that no auricles have been seen in any specimen preserved in the British Museum, and that whilst the ambulacra are without processes there is thickening of the interradia close to the peristome.

The whole matter has been reconsidered and with the same results. The five ambulacra end distinctly at the peristomial

margin within the test and a definite and clear line of suture separates them from the interradial edges. The pairs of pores are remote from the interradio-ambulacral suture and there is not a vestige of a "process."

The interradial swelling sometimes rises to a blunt, raised edge separated by a little space from the peristomial margin. This blunt part is doubtless a degenerated "ridge," and it does not appear capable of affording origin or insertion to muscular structure.

It appears that *Echinoconus* is much lower in the scale of Echinoidea with regard to perignathic structure than the species of *Discoidea*, and certainly these are degraded below those of *Holectypus*, which have a feeble yet fairly perfect girdle, jaws, and teeth.

XXVIII.—*On* Atherstonia, *a new Genus of Palæoniscid Fishes from the Karoo Formation of South Africa; and on a Tooth of* Ceratodus *from the Stormberg Beds of the Orange Free State.* By A. Smith Woodward, F.G.S., F.Z.S., of the British Museum (Natural History).

[Plate XIV.]

The only remains of Palæoniscid fishes from the Early Mesozoic Karoo Series of South Africa hitherto described or figured are some detached scales made known by Egerton * under the names of *Palæoniscus Bainii* and *P. sculptus*. However, through the generosity of the Hon. W. Guybon Atherstone, M.D., F.G.S., of Grahamstown, the British Museum is now in possession of a nearly complete fish from the Beaufort Beds of Colesberg; and it is the object of the present notice to describe and discuss the principal characters of this fossil, illustrated in the accompanying Plate XIV. figs. 1–3.

Description.

The specimen is shown, nearly one half nat. size, in Pl. XIV. fig. 1, and a flank-scale of the natural size in fig. 2, while a few scales at the base of the dorsal fin form the subject of fig. 3. The general form of the fish is well indicated; but the head is much crushed and its precise contour probably destroyed, while the extremity of the caudal fin has been

* Sir P. Egerton, "Note on the Fish-remains from Styl Krantz, South Africa," Trans. Geol. Soc. [2] vol. vii. (1856), pp. 226, 227, pl. xxviii. figs. 26–42.